

Mandatory Reporting of Greenhouse Gas Emissions for Cogeneration Facilities

California Global Warming Solutions Act of
2006 (AB 32)

December 4, 2008
Sacramento, California



California Environmental Protection Agency

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Participation Information

- Workshop materials and Guidance:
<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>
- Regulation and Final Statement of Reasons:
<http://www.arb.ca.gov/regact/2007/GHG2007/GHG2007.htm>
- Webinar information for Cogeneration Sector:
<https://www2.gotomeeting.com/register/213697878>
Phone Dial-In: 312-878-0211 Access Code: 171-125-566



Agenda

- Mandatory reporting implementation
- Review of general requirements
- Steps of reporting for cogeneration facilities
- Distributing emissions



Mandatory Reporting Rulemaking Process

- Regulation approved by Board December 2007
- Modifications released for comment
- Final Statement of Reasons (FSOR) completed October 2008
- OAL approval December 2, 2008



Coordination with Future Regulations

- ARB Scoping Plan
- U.S. EPA Mandatory Reporting
- WCI Regional Reporting



ARB Instructional Guidance for Reporting

- Instructional guidance document available at
<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>
- Provides explanatory detail and examples, suggested best practices
- Not a substitute for the regulation



ARB's GHG Reporting Tool

- ARB providing web-based platform for GHG reporting
 - Available January 2009
- Reporting tool demonstration workshop
 - December 19, 2008, 10:00 – 1:00



Review of General Reporting Requirements

Who's Responsible for Reporting?

- At facilities, the entity with operational control
- For electricity transactions, a retail provider, marketer, or facility operator



Exempt from Reporting

- Primary and secondary schools
- Hospitals
- Nuclear, hydroelectric, wind and solar power plant (except hybrids)
- Portable equipment
- Backup or emergency generators (permitted by air districts)



What Sources Are Reported

- Stationary combustion
- Process and fugitive emissions when specified
- Mobile emissions optional
- Indirect energy usage



What Gases Are Reported

- CO_2 , CH_4 , N_2O
- CO_2 from biomass fuels tracked separately
- HFCs, SF_6 , PFCs where specified



Preparing for 2009 Reports

- Must report 2008 emissions in 2009
- 2009 reports should be complete
- Emissions calculations may be based on best available data and methods
 - Regulation methods preferred
- Verification is optional for 2009 emissions reports



Preparing for 2010 Reports

- 2010 emissions data report must meet full requirements of the regulation
- Monitoring equipment should be in place by January 1, 2009
- Everyone must verify their 2009 emissions data reports in 2010



Reporting Schedules

- Power and cogen plants within larger facilities/entities are on the larger facility/entity schedule
- Other power and cogen plants and most general combustion facilities report by April 1
- Other facilities (including oil & gas) and entities report by June 1



Fuel Analytical Data Capture

- Data collected to support calculations of GHG combustion emissions
 - Mass, volume, flow rate, heat content, carbon content
- Need 80% capture rate for source verification
- For <20% missing data:
 - Use 40 CFR Part 75/60 if applicable
 - Use mean of data captured if not



Fuel Use Measurement Accuracy

- Measurement procedures must assure fuel use is quantified within $\pm 5\%$ accuracy
- Maintain and calibrate devices to achieve $\pm 5\%$ accuracy
- Quarterly calibrations of operators' solid fuel scales
- Keep records for verification



Interim Data Collection Procedure

- ARB EO can approve interim procedure if fuel monitoring equipment breaks down
- When breakdown will result in >20% data loss for report year
- Limitations and procedure in section 95103



Using CEMS

- CEMS may be used to calculate combustion and process CO₂ emissions in most cases
- Operators may install new CEMS prior to January 2011
 - Meet 40 CFR Part 75 requirements
- Operators must choose between CEMS and fuel-based options for consistent reporting



Reporting *de minimis* emissions

- Sources $\leq 3\%$ of facility emissions, not to exceed 20,000 MT CO₂e
- Still reported, but may be estimated using alternative methods



Data Completeness, Record Keeping

- Retain documents on GHG inventory design, development and maintenance for five years
- Implement internal audit and QA for reporting program
- Log changes in accounting methods, instrumentation
- Specifications in sections 95104-95105



Third Party Verification

- Optional for 2009 emissions reports
- Required beginning in 2010
- Verification opinion due 6 months after report submittal



Verification Key Steps

- Reporter contacts ARB-accredited verification body (VB)
- VB submits COI assessment to ARB
- Verification conducted following ARB OK
- Verification results discussed with reporter
- Reporter may revise report if time permits
- Verification body submits verification opinion to ARB and reporter



Verification Oversight

- ARB will provide training and accredit verifiers and verification bodies in 2009
- Verification process will assist compliance efforts and assure quality data
- Targeted review of submitted data and verifiers
- ARB responsible for enforcing regulation



Reporting for Cogeneration Facilities

Preparing for Reporting, Six Basic Steps

- 1) Determine whether you need to report—
Guidance Chapter 2
- 2) Determine reporting and verification
deadlines—Guidance Chapter 3
- 3) Design a GHG inventory management
program—Guidance Chapter 4



Preparing for Reporting, Six Basic Steps (*continued*)

- 4) Set up and document GHG calculation methods—Chapters 5, 8, 9, 13
- 5) Collect and record required data; generate and submit your GHG emissions data report—Chapters 8, 9, 13
- 6) Contract with a verifier and initiate verification (optional in 2009, required in 2010)—Chapter 6



Step 1: Determine whether you need to report

Definition of a cogeneration facility:

- May include one or more cogeneration systems
- Provides sequential generation of useful thermal energy and electricity in single, integrated systems
- May be configured as topping or bottoming cycle

Facility-level reporting thresholds:

- Facility nameplate generating capacity ≥ 1 MW
AND
- Emit $\geq 2,500$ MT of CO₂
 - from electricity-generating activities
 - in any calendar year after 2007



Example: how operational control affects applicability

A hospital has a cogeneration system on-site.

- *Nameplate generating capacity is at least 1MW.*
- *Emissions associated with electricity generation > 2,500 MT CO₂.*

Case A The cogeneration system is under operational control of the hospital.

→ Because the hospital is exempt, no reporting obligation.

Case B A separate entity owns and operates the cogeneration system. Or, a separate entity shares operational control with the hospital, and holds the permit to operate.

→ Cogeneration facility operator submits report to ARB.



Step 1: Determine whether you need to report

- 1) Determine CO₂ emissions from electricity-generating activities

→ Use specified equations to distribute CO₂ emissions

- 2) Compare to reporting threshold:
≥2,500 MT of CO₂

Step 1: Determine whether you need to report

When comparing to the reporting threshold, include CO₂ emissions from

- stationary combustion of biomass-derived and fossil fuels
- supplemental firing in the duct burner of the heat recovery steam generator, if applicable
- stationary combustion that generates waste heat recovered for electricity production in bottoming cycle plants
- process CO₂ emissions from acid gas scrubbers, if applicable

Step 1: Determine whether you need to report

When comparing to the reporting threshold, do not include

- pass-through CO₂ emissions associated with biogas generation and combustion
- fugitive or mobile emissions
- indirect emissions associated with purchased electricity or thermal energy

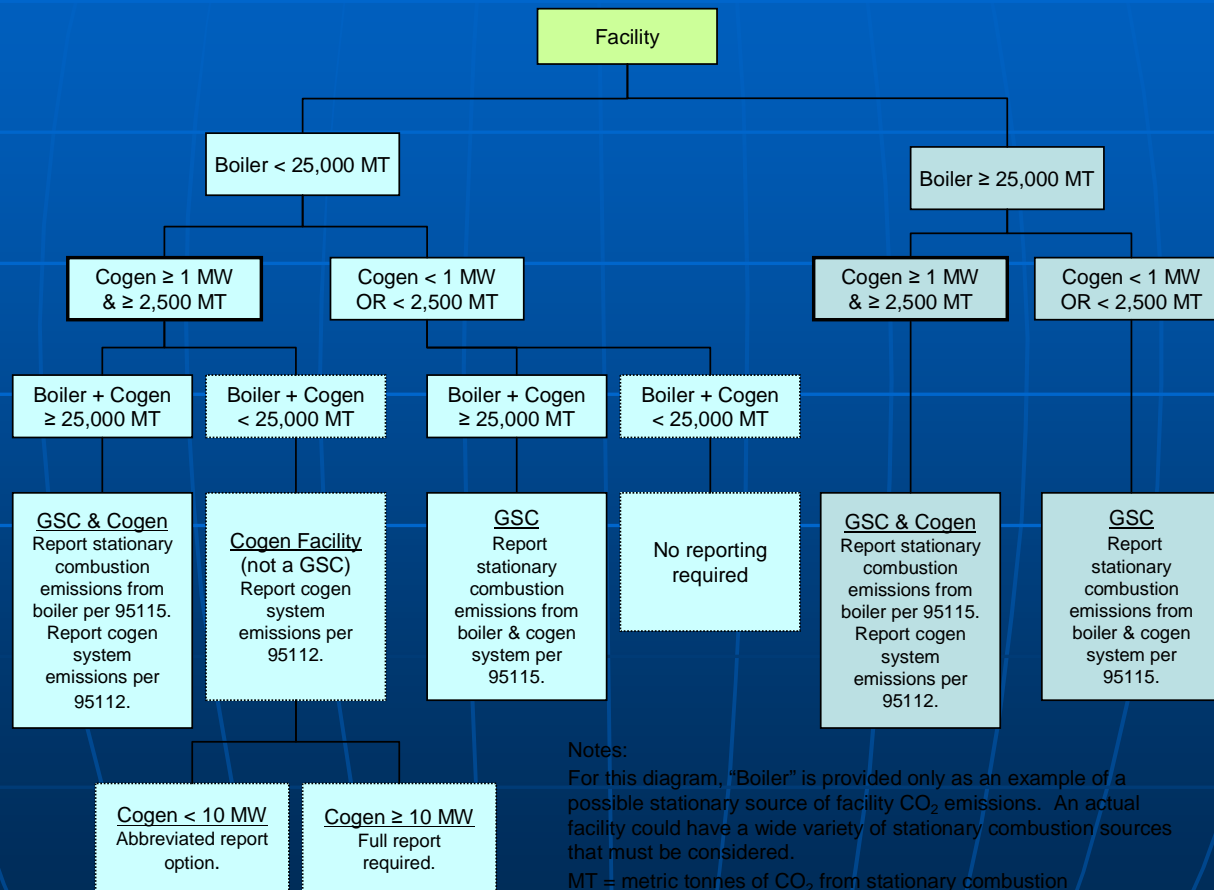
Primary and secondary sector considerations

- Cement plants
- Petroleum refineries
≥25,000 MT CO₂ in a calendar year
- Hydrogen plants
≥25,000 MT CO₂ in a calendar year
- Electricity generating facilities
≥ 1 MW and ≥2,500 MT CO₂ in a calendar year
- Other industrial facilities -
“general stationary combustion facilities”
≥25,000 MT CO₂ in a calendar year



Primary and secondary sector considerations

Figure 12.1. Stationary Combustion and Cogeneration Reporting Applicability



Notes:

For this diagram, "Boiler" is provided only as an example of a possible stationary source of facility CO₂ emissions. An actual facility could have a wide variety of stationary combustion sources that must be considered.

MT = metric tonnes of CO₂ from stationary combustion



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Step 2: Determine reporting and verification deadlines

- Cogeneration plants within larger facilities/entities that are subject to reporting report and verify on the schedule of the larger facility/entity
- Other cogen plants report by April 1 and verify by October 1



Step 3: Design a GHG Inventory Management Program

Emissions data report for cogeneration facilities, section 95112(a)

- Facility- and generating unit-level info.
- Cogeneration system description
- Electricity generation and end-use
- Thermal energy production and end-use
- Distributed emissions
- Abbrev. report for specified facilities



Step 4: Set up and document GHG calculation methods

General Information Reported

- Direct stationary combustion emissions:
CO₂, CH₄, N₂O by fuel type
 - CO₂ from biomass-derived fuels separate
- Specified process and fugitive emissions:
CO₂, SF₆, HFCs, CH₄
- Fuel consumption by fuel type
- Indirect emissions, electricity in kWh
- Mobile emissions optional



Step 4: Set up and document GHG calculation methods

	Electrical Generating Facilities & Retail Providers	Cogeneration
Reporting Requirements Section in Regulation	95111	95112
CO₂ Emissions From Combustion		
Associated Gas		95125(c)-(e) or (g)
Biogas and Landfill Gas	95125(c)-(d) or (g)	95125(c)-(d) or (g)
Biomass Fuels	95125(g) CO ₂ CEMS if available; if not then (c)-(d) or (g)-(h)	95125(g) CO ₂ CEMS if available; if not then (c)-(d) or (g)-(h)
Coal and Petroleum Coke	40 CFR Part 75 if applicable (includes App G); if not then 95125(d) or (g)	40 CFR Part 75 if applicable (includes App G); if not then 95125(d) or (g)
Flexigas	95125(d)(3)(A) or (g)	95125(d)(3)(A) or (g)
Middle Distillates, Gasoline, Residual Oil, or Gas (LPG) Liquefied Petroleum	40 CFR Part 75 if applicable; if not then 95125(c)-(d) or (g)	40 CFR Part 75 if applicable; if not then 95125(c)-(d) or (g)

See ARB Guidance, Table 8.8
Matrix of Methodologies



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Step 4: Set up and document GHG calculation methods

Emissions calculations by fuel type

- CO₂ methods
 - 40 CFR Part 75 - data sent to U.S. EPA
 - 95125(c) - measured heat content
 - 95125(d) - measured carbon content
 - 95125(g) - CEMS CO₂ or O₂
 - 95125(h) - measured steam or source-specific EF
- N₂O and CH₄ methods, 95125(b)
 - Default emission factor
 - Measured heat content
 - Source-specific emission factor



Step 4: Set up and document GHG calculation methods

Options to Develop Source-specific Emission Factors (EFs)

- Source Test Plans approved by ARB
- N₂O and CH₄ source-specific EFs
 - Option for all facilities
- CO₂ source-specific EFs
 - Option for facilities that combust biomass solid fuels, MSW, or waste-derived fuels; also geothermal



Source Test Process

- Prepare source test plan
 - See ARB guidance for template
 - Include test methods, schedule, sampling locations, QA/QC, etc.
- Submit plan to ARB for approval
- On approval, perform testing, providing ARB and air district notification of test dates for possible agency participation
- Using valid test data, develop appropriate emission factor(s)



Planning for Source Testing

- Schedule enough time for test plan preparation, approval, on-site testing, and data analysis
- GHG reporting deadlines cannot be delayed if source test data are not ready
 - Use other specified estimation methods in regulation if source test data not available
- ARB staff is providing written guidance and resources



Step 5: Collect and record required data; generate & submit report

- Assure ARB has correct contact information.
- Gain familiarity with ARB's on-line reporting tool
- Enter data into the appropriate data fields provided in the tool.
- Tool will have limited calculation functions, or the reporter may override the calculating tool and enter the data directly.



Distributing CO₂ Emissions

Distributing CO₂ Emissions: General Procedure (1)

- 1) Determine the total direct CO₂ emissions from stationary combustion for the cogeneration system. For bottoming cycle plants, include the combustion source for the manufacturing process that generates the initial waste heat.
- 2) Determine energy flows for the cogeneration system configuration expressed in MMBtus, including output flows of useful thermal energy and electric energy. For bottoming cycle plants, input fuel energy is required.



Distributing CO₂ Emissions: General Procedure (2)

- 3) Determine the efficiencies of thermal energy and electricity production.
- 4) Determine the fraction of emissions allocated to thermal energy production and electricity generation and report the distributed emissions. For bottoming cycle plants, include emissions allocated to the manufacturing process.



Distributing CO₂ Emissions: General Procedure (3)

When reporting distributed emissions,

- Include CO₂ emissions from
 - stationary combustion of fossil fuels only
 - supplemental firing in the duct burner of the heat recovery steam generator, if applicable
 - stationary combustion that generates waste heat recovered for electricity production in bottoming cycle plants

Distributing CO₂ Emissions: General Procedure (4)

When reporting distributed emissions,

- Do not include
 - stationary combustion of biomass-derived fuels
 - pass-through CO₂ emissions associated with biogas generation and combustion
 - process CO₂ emissions from acid gas scrubbers
 - fugitive or mobile emissions
 - indirect emissions associated with purchased electricity or thermal energy

Distributing CO₂ Emissions: General Procedure (5)

Reporting distributed emissions when combusting both biomass-derived and fossil fuels:

- Distribute fossil fuel emissions when above *de minimis*.
- CO₂ emissions from biomass-derived fuels, including pass-through emissions, are reported, but not distributed.

Distributing CO₂ Emissions: General Procedure (6)

Reporting distributed emissions when combusting both biomass-derived and fossil fuels:

- Parameters are based on total energy flows from combustion of both fuel types.
- In the final distribution, the fractions of emissions determined are multiplied by the CO₂ emissions from fossil fuel combustion only (E_T), to calculate E_H , E_p , and for bottoming cycle plants E_M .

Types of Cogeneration

Topping Cycle Plants

- Energy input used to produce useful power output
- Waste heat used to provide useful thermal energy

Bottoming Cycle Plants

- Energy input applied to useful thermal energy application or process
- Waste heat used for power production



Distributed Emissions—General Procedure: Topping Cycle Data

<i>Required Data</i>	<i>Optional data</i>	<i>Units</i>	<i>Data Source</i>
$E_{T\ CO_2}$ - Total direct CO ₂ emissions from the cogeneration system from stationary combustion		MT	operator measured - determine CO ₂ emissions based on fuel quantities and fuel types or CEMS.
H - total useful thermal output		MMBtu	operator measured
P_{MWh} - power generated	See ARB Guidance, Table 9.4.1a		
	F - total fuel input, higher heating value weighted average	MMBtu	operator (or fuel supplier) measured - higher heating value based on method in section 95125(c)
	e_p - efficiency of electricity generation	Percent	operator determined facility-specific value or default value provided
	e_H - efficiency of thermal energy production	Percent	equipment manufacturer's rating or default value provided



Example 1: Topping Cycle Emissions Distribution (1)

Nameplate generating capacity > 10 MW

Prime mover: gas turbine

Combusts 970 million scf of natural gas

Operator uses method 95125(c) to calculate CO₂ emissions using measured heat content.

Records monthly measurements:

- quantity of fuel combusted
- associated higher heating values



Example 1: Topping Cycle Emissions Distribution (2)

CO₂ emissions from combustion are

- calculated and summed for the report year
- then distributed between electricity generation and thermal energy production.



Distributed Emissions—General Procedure: Bottoming Cycle Data

<i>Required Data</i>	<i>Optional data</i>	<i>Units</i>	<i>Data Source</i>
$E_{T\ CO_2}$ - Total direct CO ₂ emissions from the cogeneration system from stationary combustion		MT	operator measured - determine CO ₂ emissions based on fuel quantities and fuel types or CEMS.
H - Total useful thermal output		MMBtu	operator measured
HRSG - output of heat recovery generator		MMBtu	operator measured
	H_{ST} - input steam to steam turbine, if measured	MMBtu	operator measured
H_e - exothermic heat from manufacturing process, if applicable		MMBtu	calculated or operator determined
P_{MWh} - Power generated		MWh	operator measured

See ARB Guidance, Table 9.4.2



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Example 2: Bottoming Cycle Emissions Distribution

- Cement plant
- Combusts coal for cement manufacture
- Combusts natural gas in the duct burner of the heat recovery steam generator (supplemental firing)



Step 6: Contract with a verifier and initiate verification

- Will be provided by third-party consultants and air districts that meet accreditation criteria
- Includes a conflict of interest policy
- ARB will play an oversight role
- Consistent with ISO 14064-3, ISO 14065, and EU practices



Next Steps

- Examine ARB final regulation and Instructional Guidance
- Attend or monitor reporting tool workshop December 19
- Consult with ARB staff on questions
- Join e-mail list serves on reporting, verification, watch for additional training opportunities



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GHG Mandatory Reporting Website

<http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm>



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